OXFORD JOURNAL
OF STUDENT
SCHOLARSHIP

Does Economic Growth Exhibit a Systematic Relationship With Wildlife Trade?

Neil Mehra
mneil@tisb.ac.in

ABSTRACT

Illegal wildlife trade (IWT) is regarded as a major environmental issue. Economic growth is thought to increase wildlife trade by expanding markets and increasing purchasing power. However, empirical analyses linking macroeconomic change to IWT remain limited. This paper examines whether economic growth is associated with illegal wildlife trade by using a cross-country dataset covering 148 countries from 1990 onwards. Our seizure records are taken from the TRAFFIC database and are used as an estimate of illegal wildlife trade, while economic growth is measured using real GDP growth data from the Quality of Government dataset. The analysis uses a linear regression model with country- and time-fixed effects to control for country-specific dynamics and global trends.

The initial regression, prior to the inclusion of fixed effects, suggests a small positive relationship between economic growth and seizures. However, once country and time fixed effects are included, the relationship disappears and becomes statistically insignificant. These findings suggest that economic growth does not display a consistent relationship to illegal wildlife trade. Instead, wildlife crime appears to be affected by growth in opposing supply- and demand-side economic forces that ultimately do not provide a systematic relationship. Our paper explores, based on our findings, how ideal wildlife protectionist policies should be growth-invariant, meaning that they should remain robust regardless of changes in economic growth.

INTRODUCTION

Illegal wildlife trade (IWT) is a significant ecological challenge. In both academic and policy discourse, economic growth and its impacts are often portrayed as a driver of increased wildlife exploitation. However, this widely held assumption is not strongly supported by empirical evidence. This paper examines the relationship between economic growth and illegal wildlife trade, asking whether rising economic prosperity is in fact associated with greater levels of wildlife crime.

Understanding the relationship between economic growth and illegal wildlife trade is crucial, as economies need to be well-informed about the potential consequences of economic growth. As economies expand, changes in incomes, poverty levels, inequality, and wealth distribution affect consumption patterns and, presumably, the scale of illegal wildlife trade. Examining the link between economic growth

and illegal wildlife trade helps distinguish between commonly assumed relationships and those that are empirically observable. This research can inform policy and influence the methods by which government and conservationist bodies approach wildlife protection measures as countries grow and as their socio-economic contexts evolve.

Examining the relationship between economic growth and illegal wildlife trade, however, is not straightforward; difficulties with data and methodological challenges have left the question insufficiently answered. It is difficult to assess the size of illegal trade since it is part of the underground or black economy. As such, measures are commonly imputed using seizure records and/or reported incidents. Partly for this reason, existing research has tended to prioritise theoretical explanations or case-specific studies, with cross-country empirical analysis relatively underdeveloped.

This paper examines the relevant literature, outlines the data and methodology used, presents the results, and concludes.

LITERATURE REVIEW

IWT is typically studied as an economic and conservation problem. Despite its importance, there is little literature linking macroeconomic change to wildlife crime. Most existing research studies this connection through demand- and supply-side incentives. Economic conditions thus affect consumers' willingness to purchase illegal wildlife products and producers' incentives to supply them. It is reasonable to assume that consumption of illegal wildlife products increases as economies grow and societies become wealthier. Conversely, on the supply side, poaching and trafficking are more common in poorer economies. These forces do not necessarily move in the same direction, and they may even offset each other. This paper examines how these opposing effects interact and offers an explanation for the limited empirical evidence linking economic growth and IWT.

A substantial body of research focuses on the supply-side link between poverty and wildlife crime. Duffy et al. (2015) suggest that poor living conditions can increase hunting, as poaching becomes the main source of income for many households. In a similar vein, Lunstrum and Givá (2020) and Anagnostou et al. (2021) point out that financial stress can increase involvement in wildlife crime. Knapp et al. (2017) further emphasise how limited economic opportunities can increase motivation to poach. Taken together, these studies imply that economic improvement may reduce IWT by lowering poverty-driven incentives, though this relationship may vary with access to alternative livelihoods.

In contrast, other research highlights the demand-side role of wealth and consumption in driving IWT. Myers and Kent (2004) argue that rising wealth can increase demand for illegal wildlife products, particularly where consumption is linked to status, luxury preferences, or cultural practices. Zhou et al. (2015) similarly emphasise that private possession plays a major role in driving illegal wildlife demand, since the expansion of consumer markets may increase trade. This implies that economic growth may raise IWT by increasing purchasing power and expanding the market for wildlife products.

These competing perspectives suggest that economic growth may not exert a single, unidirectional effect on illegal wildlife trade. On the one hand, growth may reduce IWT owing to poverty reduction and

improved livelihoods, taking households out of the black economy into the formal one. On the other hand, IWT would simultaneously increase as that very same economic growth strengthens demand and private consumption incentives. As a result, the overall relationship between GDP growth and seizure-based measures of IWT may appear inconsistent in cross-country data if the opposing demand and supply mechanisms offset each other. This study contributes to the literature by testing whether economic growth is associated with illegal wildlife trade, using a cross-country framework with country- and time-fixed effects.

DATA AND LIMITATIONS

The data used for the cross-country analysis, annual real GDP growth and wildlife seizure measures were obtained primarily from two sources. Data on real GDP growth were taken from the Quality of Government (QoG) database. However, it should be noted that the real GDP growth values reported by QoG did not always exactly match those published by the World Bank. The figures were consistently similar with minor differences. These discrepancies were small and did not impact potential trends, but must be acknowledged as they provide some degree of uncertainty. The measured seizures for each country were obtained from the Trade Records Analysis of Flora and Fauna In Commerce (TRAFFIC) website. To convert the readings from the description form to numerical values, an algorithm was run to measure each incident as a singular recorded seizure. Cases where multiple types of illegal goods were captured simultaneously were treated as separate.

Post cleansing and merging, the final dataset contains records for 148 countries starting from 1990. Coverage was, however, uneven across countries, particularly due to inconsistent reporting in the early years. Observations that contained missing values were dropped from the final sample.

The use of cross-country GDP growth data allows for a comparative analysis across different stages of economic development. This more top-down view allows for the identification of generalised patterns, mitigating the impact of the unique context or dynamics of a specific country. The highest degree of uncertainty and chance of error comes from the value of the seizures themselves. The algorithm did not account for the amount of goods in the seizures; the capture of one illegal item and thirty identical items were both treated as a single seizure. Further, years in which seizures were recorded as zero were dropped from the dataset. This decision was made to avoid ambiguity: a zero value could indicate either the absence of seizures or, as is more likely the case, a lack of reporting. Excluding these observations reduces ambiguity in interpretation. The downside, however, is that this may bias the sample toward countries and years with active enforcement and overstate the intensity of seizures. This, in turn, would weaken or obscure the ability to make connections between growth-related changes in situations with poor or missing reporting.

The study also does not directly account for or measure seizures relative to a country's population. As such, a country with a larger population would have inflated seizure numbers, irrespective of its economic growth. An additional source of measurement error arises from the international nature of illegal wildlife trade. Seizures are recorded in the country where enforcement occurs, even though the country where the demand for such goods exists may not be the same. This introduces more noise in the dataset, as the

country against which the data is recorded may not always reflect the economic context that is most relevant.

The use of seizures as a proxy is itself a limitation. Seizures are not an accurate indicator of the scale of the illegal wildlife trade. Rather, seizure counts are also a measure of the corruption, reporting practices and overall security within a country. Underdeveloped or corrupt countries may report lower-than-expected figures because illegal activity is less likely to be detected or reported. Conversely, richer countries may display higher seizure counts simply as a result of better enforcement, not higher poaching. As a result, seizure values are influenced by institutional factors, funding, and corruption rather than the true scale of the activity. Observations about the relationship between economic growth and seizure counts must, therefore, be interpreted with caution. Seizure patterns may be driven by changes in governance or enforcement effectiveness without necessarily reflecting underlying changes in the wildlife trade itself.

Before analysis, the data were in a tabular, raw format. It was processed, and missing values for GDP growth and seizures were dropped. The GDP growth and seizure records were then merged by country and year. The 1st and 99th percentiles of GDP growth were dropped to ensure that macro shocks or extreme numbers did not skew the data. The outliers of the seizure count were not dropped, but instead transformed using the natural logarithm. This reduced the right-skewness of the data set while simultaneously limiting the influence of extreme values.

METHODOLOGY

The seizure data were obtained from the Trade Records Analysis of Flora and Fauna in Commerce (TRAFFIC) website, which required permission to access. Permission was requested and granted before the data were downloaded and processed. The raw data from the TRAFFIC tables were run through an algorithm that removed duplicate results (though the dataset already avoided duplicates, our method served as a safeguard). Due to inconsistent reporting quantities, different product types, and measurement units, the algorithm counted each descriptive result as a single case. Seizures to be distributed to multiple countries or originating from various countries were treated as separate country-linked observations. The dataset, therefore, measures how many times a country was linked to seizure activity, rather than counting only unique physical seizures. Illegal wildlife trade is transnational in nature, and a seizure linked to multiple countries may reflect a broader trafficking network than one involving only a single country. Seizures associated with multiple countries indicate wider distribution and markets, and therefore a potentially larger underlying wildlife trade. Multiple-variable seizures were counted as a single case, since the study focused on country-level involvement rather than the diversity of wildlife products within a shipment. The processed seizure records were then grouped by country and year to produce a single annual seizure total for each country.

This study employs a linear regression framework to help analyse the relationship between economic growth and seizures over time. To help measure this change, the study used fixed effects of country and time. The equation for the model is given by:

$$\ln(Seizures_{it}) = \beta_0 + \beta_1 * GDPGrowth_{it} + \alpha_i + \gamma_t + \varepsilon_{it}$$

where *i* indexes countries and *t* indexes years. The dependent variable for the equation is the natural logarithm of the seizures, and the main explanatory variable is annual GDP growth (real). The terms α_i and γ_t represent country fixed effects and time fixed effects, respectively, while ε_{it} is the error term.

A log-linear fixed-effects OLS method was used to reduce the data's right-skewness. Further, it limits the influence of extreme seizure counts. Poisson and negative-binomial fixed-effects are also commonly used for count data. The data was highly overdispersed, meaning that the variance was far greater than the mean of the seizure counts. In the cleaned regression sample, the variance was 2234, while the mean was only 16.42, giving a variance-to-mean ratio of 136.1. Since Poisson models are generally more appropriate when the variance is close to the mean, this makes the Poisson model less preferred. Negative-binomial fixed effects are a relevant alternative, as they are better suited to overdispersed count data, but were not used in this analysis. Instead, they are acknowledged as a potential robustness check for future research.

Country fixed effects, α_i, control for time and growth invariant characteristics of each country. Factors such as geography, prevalence of wildlife, cultural attitudes and beliefs, and long-standing institutional factors are held constant. As a result, the model isolates the relationship between growth patterns within a country over time and changes in seizure counts, rather than relying on cross-country differences that may also reflect trends derived from variations in the above-mentioned characteristics.
Time fixed effects, γ_t, account for global shocks or events that affect all countries simultaneously. These include global demand for wildlife products, international trade protection laws and measures, improvements in detection mechanisms and major disruptions such as the COVID-19 pandemic. The model isolates country-specific relationships between growth and seizures, rather than global trends.

The use of a fixed-effects linear regression framework enables a more empirical analysis of the relationship. This approach may offer a more grounded analysis than theoretical observations. This methodology tests whether economic growth shows a consistent relationship with illegal wildlife trade after factoring out country- and time-specific differences. Without controlling for fixed effects, the estimated relationship between economic growth and illegal wildlife trade may be biased by unobserved country-specific and temporal factors, making it impossible to distinguish genuine within-country dynamics from spurious correlations.

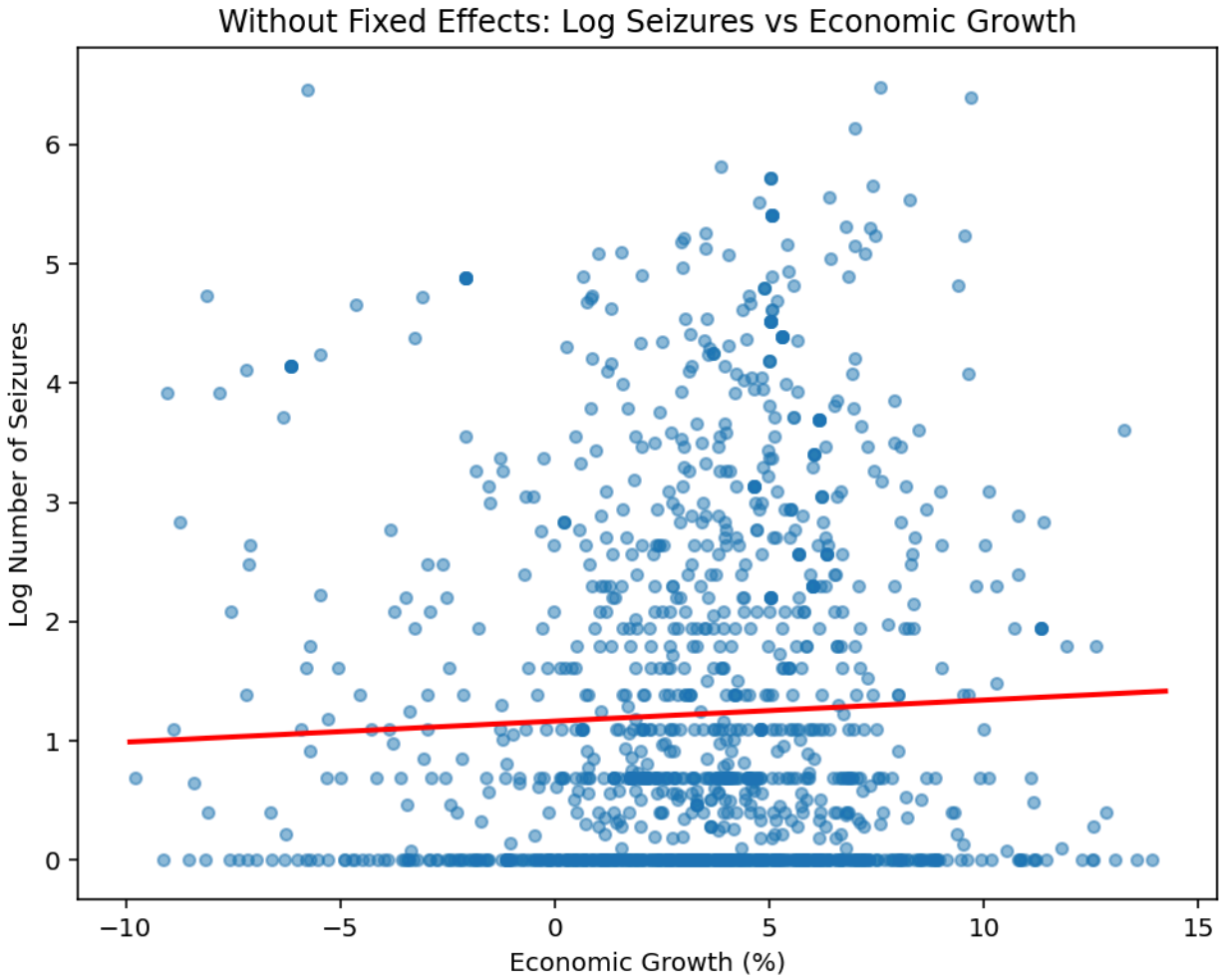
RESULTS

Variable	Coefficient	std_err	t_or_z	p_value	ci_lower	ci_upper
Constant	1.172	0.037	31.602	0.00	1.099	1.245
GDP Growth	0.0141	0.007	2.049	0.04	0.001	0.028

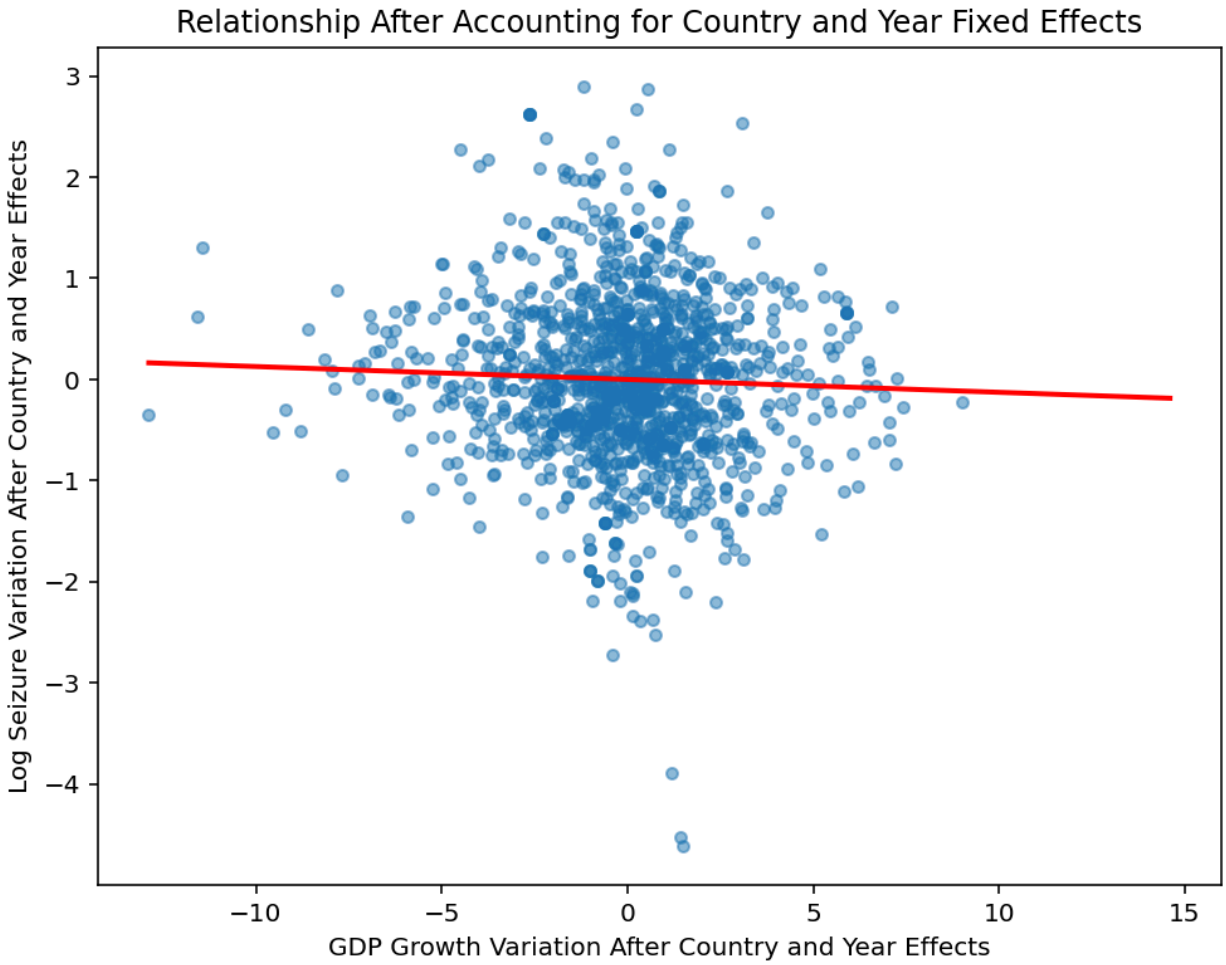
RELATIONSHIP WITHOUT FIXED EFFECTS (FIG 1.1)

Variable	Coefficient	std_err	t_or_z	p_value	ci_lower	ci_upper
Intercept	-2.422	0.146	-16.636	0.00	-2.707	-2.137
GDP Growth	-0.003	0.006	-0.475	0.64	-0.016	0.009

RELATIONSHIP WITH FIXED EFFECTS (FIG 1.2)



SCATTER PLOT WITHOUT FIXED EFFECTS (FIG 1.3)



SCATTER PLOT WITH FIXED EFFECTS (FIG 1.4)

Figure 1.1 presents the linear regression equation relating economic growth to seizures; Figure 1.2 shows the regression results after accounting for time- and country-fixed effects. The key variable to note is GDP Growth.

Figure 1.3 is a scatter plot showing the log of the number of seizures on the y-axis and economic growth on the x-axis. The scatter plot shows the relationship before incorporating fixed effects. Figure 1.4 similarly shows the relationship between economic growth and log seizure counts, after accounting for country- and year-fixed effects. For readability, the scatter plots show a 50% sample of all plots. This change was made just for visibility. The regression results in the paper include all plots except the 1st and 99th percentiles of GDP growth. Each table displays the estimated coefficient for real GDP growth, the standard error, the test statistic, and the p-value. The coefficient measures the average relationship between changes in GDP growth and those in the logarithm of seizure counts. Standard errors represent sampling uncertainty; test statistics and p-values indicate whether the estimated relationship is

statistically distinguishable from zero. The intercept (constant) represents the level of logged seizures when the GDP growth is zero. It acts as a scaling term, not a quantity of substantive interest.

In Figure 1.1, before time and fixed effects were run, GDP growth shows a positive, statistically significant coefficient, suggesting that higher growth rates are associated with higher seizure counts. However, as noted in the data limitations, seizure counts also serve as a measure of detection quality. High seizure counts may also result from improved enforcement rather than from actual wildlife trade. According to the relationship, a 1% increase in economic growth is associated with a 0.014 increase in the logarithm of seizures. At 0.04, the p-value suggests that the relationship is statistically significant: it shows that there is only a ~4% chance of observing this result if there were no actual relationship. This suggests that the observed relationship is not a product of chance, providing evidence of a positive association in the pooled model. The t-statistic (2.049) is just above the threshold for statistical significance. This suggests that the relationship is unlikely to be due to chance; the null hypothesis is likely false.

However, there are practical limitations in Fig 1.1. The analysis does not account for large-scale systematic differences across countries. It also does not control for macroeconomic shocks that may impact all countries simultaneously. Furthermore, measures of seizure reporting start from different baselines and are impacted by several factors, namely governance, biodiversity, trade and reporting practices. As discussed in the limitations section above, differences across countries are also impacted by population size: countries with bigger populations may naturally record more seizures regardless of economic growth rates. Seizure counts may also be affected by improvements in global regulation or detection, rather than economic conditions. Hence, while the pooled regression displays a statistically significant positive relationship, its practical significance remains limited. The coefficient is small and may reflect differences in enforcement, reporting practices, or country-specific conditions rather than a meaningful rise in illegal wildlife trade.

Thus, the positive coefficient in Figure 1.1 may reflect cross-country or time-specific differences rather than the true relationship. The coefficient is positive; however, its magnitude is quite low: a one percentage point increase in GDP growth is associated with only about a 1.4% increase in seizure counts. This estimate should also be interpreted cautiously because the seizure variable captures the number of incidents rather than the quantity of wildlife goods involved. Seizures involving a single item are treated the same as those involving many items. Hence, the true scale of the wildlife trade may be far larger than the figures suggest. Since seizures are log-transformed, the percentage change in seizures can be calculated using the formula:

$$\% \Delta \text{ seizures} = (e^{0.014} - 1) \times 100 \approx 1.41\%$$

For this reason, the initial descriptive association does not establish a consistent or reliable relationship between economic growth and illegal wildlife trade. In addition, as described in the data limitations, observations where seizure counts were recorded as zero were removed from the dataset to avoid ambiguity between true zeros and missing reporting. While this improves interpretability, it may bias the

sample toward countries and years with active enforcement and therefore influence the apparent intensity of seizures in the regression results.

In Figure 1.2, after controlling for both country- and time-fixed effects, the estimated relationship between GDP growth and seizures changes significantly. As shown in Figure 1.4, the positive relationship in Figure 1.3 largely disappears once country- and year-fixed effects are accounted for. The coefficient on GDP growth becomes negative (−0.003) and is statistically indistinguishable from zero, with a standard error of 0.006 and a t-statistic of −0.475. Based on the 0.64 p-value, there is no evidence of a systematic link between economic growth and changes in seizure counts after accounting for intra-country differences and global trends. The difference in results underscores the importance of considering the different structural characteristics of countries, including reporting and detection (as mentioned above in the data limitations section). The coefficient is also negligible: a one percentage point increase in GDP growth is associated with a ~0.3% decrease in seizures when viewed in percentage terms. The relationship, then, is not statistically significant, making the null hypothesis not only possible but likely.

DISCUSSIONS

The absence of a systematic relationship in the fixed-effects model suggests that economic growth does not affect illegal wildlife trade in a single, uniform direction. This could be true for multiple different reasons. The biggest of these reasons is that economic growth pushes illegal wildlife trade in two opposite directions. Economic growth is linked to rising purchasing power, potentially increasing demand for wildlife. Rapid economic growth is also linked to rising inequality (Mancur, 19663), which increases the pool of people willing to poach (Lunstrum and Givá, 2020), thus implying a positive relationship. Even if illegal wildlife trade does not increase, improvements in institutional factors, reduced corruption, and better reporting and detection practices can increase the number of seizures reported. This is particularly relevant given that the seizure data used in this study capture enforcement outcomes rather than the full volume of illegal wildlife trade, as discussed in the data limitations. On the other hand, this may deter poaching. Furthermore, an increase in economic development that may arise from economic growth may reduce the demand for poaching as education and awareness improve.

The nature of illegal wildlife trade is also highly transnational(Warchol, 2007). As noted earlier in the limitations section, seizures are recorded in the country where enforcement occurs, which may differ from the country where the economic drivers of demand exist. Consequently, economic conditions that generate demand may exist in one country while seizures are recorded in another where enforcement occurs, weakening any direct country-level association between domestic growth and recorded seizures. Therefore, the null fixed-effects result should be interpreted as showing no clear relationship between GDP growth and recorded seizure outcomes, rather than proving that economic conditions have no effect on illegal wildlife trade whatsoever. In some countries, poaching activity may already be operating at full capacity. This means that even if demand increases, the supply side may not increase due to practical or ecological limits on poaching. Economic growth does not consistently show changes in illegal wildlife trade. Relationships that appear in simpler models are likely impacted by enforcement, reporting practices and cross-border trade, rather than growth itself.

These findings suggest that policymakers should not assume illegal wildlife trade will rise automatically with economic growth. Equally, they should not relax enforcement by assuming that development alone will reduce wildlife crime. Instead, wildlife protection policies should be consistently implemented regardless of growth conditions, with attention directed toward governance and enforcement capacity rather than GDP growth. At the same time, where economic growth increases purchasing power, policy responses may need to focus on reducing consumer demand. This would include the regulation of domestic markets and measures aimed at reducing the cultural incentives for wildlife consumption (Rosen, 2021).

CONCLUSION

This study examines whether economic growth is associated with increased illegal wildlife trade. It used a cross-country analysis to empirically evaluate the relationship, using time and country fixed effects to estimate a linear regression. While the initial pooled linear regression without fixed effects showed a small positive relationship, it disappeared upon adding fixed effects. The null result should, however, be interpreted cautiously, as seizures are an imperfect proxy for illegal wildlife trade. These fixed effects controlled for differences in geography and wildlife prevalence across countries, as well as events that may have affected the market for illegal wildlife goods. As such, one can conclude that economic growth, in itself, has no significant bearing on illegal wildlife trade.

The results challenge the common assumption that economic growth consistently increases or decreases seizure levels. Instead, this paper suggests that wildlife trade is also shaped by other factors. Economic growth appears to affect IWLT through opposing demand and supply mechanisms. Demand is expected to rise as more luxury goods are purchased with increased wealth and purchasing power. This phenomenon may be counterbalanced by a drop in supply due to reduced poverty that, in turn, reduces the need to poach, even as governance standards improve with increasing national prosperity. Thus, growth alone is an insufficient determinant of wildlife trade across countries.

From a policy perspective, this suggests that conservation outcomes cannot be delegated to economic growth. Wildlife protection efforts should remain consistently enforced regardless of growth conditions. The only consideration of countries experiencing economic growth with respect to illegal wildlife trade should be to focus on policies to reduce the demand for such goods. On a hopeful note, the absence of a growth-driven increase in illegal wildlife trade implies that economic growth and illegal wildlife trade do not necessarily come with a tradeoff. With appropriate and sustained measures to reduce poaching and the demand for those goods, countries may be able to pursue economic growth without worsening the consequences on vulnerable wildlife at risk of being poached.

REFERENCES

Bansal, Sangeeta. "Environmental Quality: Impact of Economic Growth." *Environment and Development Economics*, vol. 20, no. 5, Nov. 2015, pp. 673–696. *JSTOR*, www.jstor.org/stable/26392027, https://doi.org/10.2307/26392027.

Olson, Mancur. "Rapid Growth as a Destabilizing Force." *The Journal of Economic History*, vol. 23, no. 4, 1963, pp. 529–552. *JSTOR*, www.jstor.org/stable/2116214, https://doi.org/10.2307/2116214.

Feng, C., Wang, H., Lu, N., Chen, T., He, H., Lu, Y., & Tu, X. M. (2014). Log-transformation and its implications for data analysis. *pmc.ncbi.nlm.nih.gov*. https://doi.org/10.3969/j.issn.

WU, YUSHAN. *Understanding China and South Africa's Illegal Wildlife Trade*. South African Institute of International Affairs, 2015, https://www.jstor.org/stable/resrep25972.

Warchol, Greg L. "The Transnational Illegal Wildlife Trade." *Criminal Justice Studies*, vol. 17, no. 1, Mar. 2004, pp. 57–73, https://doi.org/10.1080/0888431042000167933 4.

Lunstrum, Elizabeth, and Nícia Givá. "What Drives Commercial Poaching? From Poverty to Economic Inequality." *Biological Conservation*, vol. 245, no. 108505, May 2020, p. 108505, https://doi.org/10.1016/j.biocon.2020.108505.

Ortiz, Fran. "A Review Of: "the New Consumers: The Influence of Affluence on the Environment."" *Journal of International Wildlife Law & Policy*, vol. 9, no. 2, July 2006, pp. 200–203, https://doi.org/10.1080/13880290600728245.

Duffy, Rosaleen, et al. "Toward a New Understanding of the Links between Poverty and Illegal Wildlife Hunting." *Conservation Biology*, vol. 30, no. 1, 23 Nov. 2015, pp. 14–22, https://doi.org/10.1111/cobi.12622.

Organisation for Economic Co-operation and Development. 2024. "Country Statistical Profiles: Key Tables from OECD.", oecd_evogdp_t1, https://doi.org/10.1787/20752288.

Teorell, Jan, Aksel Sundström, Holmberg Sören, Rothstein Bo, Natalia Alvarado Pachon, Dalli Cem Mert, Rafael Lopez Valverde, Victor Saidi Phiri, and Laura Gerber. 2025. The Quality of Government Standard Dataset, Version Jan25. University of Gothenburg. The Quality of Government Institute. https://doi.org/10.18157/QoGStdJan25

Knapp, Eli J, et al. "Assessing Objective and Subjective Measures of Poverty among Illegal Hunters Outside Ruaha National Park, Tanzania." *Conservation and Society*, vol. 15, no. 1, 2017, pp. 24–32. *JSTOR*, www.jstor.org/stable/26393268, https://doi.org/10.2307/26393268.

Zhou, Zhao-Min, et al. "Private Possession Drives Illegal Wildlife Trade in China." *Frontiers in Ecology and the Environment*, vol. 13, no. 7, Sept. 2015, pp. 353–354, https://doi.org/10.1890/15.wb.014.

Anagnostou, Michelle, et al. "Poverty, Pandemics, and Wildlife Crime." *Conservation & Society*, vol. 19, no. 4, 2021, pp. 294–306, www.jstor.org/stable/27081516.

Rosen, Tanya. "The Evolving War on Illegal Wildlife Trade." *JSTOR*, 2020, www.jstor.org/stable/resrep29278.

TRAFFIC. *Wildlife Trade Portal*. Database, https://www.wildlifetradeportal.org/. Accessed Oct, 2025.

Myers, Norman, and Jennifer Kent. "New Consumers: The Influence of Affluence on the Environment." *Proceedings of the National Academy of Sciences of the United States of America*, vol. 100, no. 8, 2003, pp. 4963–4968. *JSTOR*, www.jstor.org/stable/3144049, https://doi.org/10.2307/3144049.